



**CALIFORNIA  
ENERGY COMMISSION**



California Energy Commission  
Clean Transportation Program

## **FINAL PROJECT REPORT**

# **City of Riverside New Compressed Natural Gas Fueling Station**

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**Prepared by: City of Riverside**

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# California Energy Commission

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# PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program. The statute authorizes the California Energy Commission (CEC) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) reauthorizes the Clean Transportation Program through January 1, 2024, and specifies that the CEC allocate up to \$20 million per year (or up to 20 percent of each fiscal year's funds) in funding for hydrogen station development until at least 100 stations are operational.

The Clean Transportation Program has an annual budget of about \$100 million and provides financial support for projects that:

- Reduce California's use and dependence on petroleum transportation fuels and increase the use of alternative and renewable fuels and advanced vehicle technologies.
- Produce sustainable alternative and renewable low-carbon fuels in California.
- Expand alternative fueling infrastructure and fueling stations.
- Improve the efficiency, performance and market viability of alternative light-, medium-, and heavy-duty vehicle technologies.
- Retrofit medium- and heavy-duty on-road and nonroad vehicle fleets to alternative technologies or fuel use.
- Expand the alternative fueling infrastructure available to existing fleets, public transit, and transportation corridors.
- Establish workforce-training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC issued PON-11-602 to provide funding opportunities under the ARFVT Program for the installation of a 24/7, fast-fill, publicly accessible compressed natural gas station that is adequately sized for the number of compressed natural gas vehicles that will use the station. In response to PON-11-602, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards April 24, 2012 and the agreement was executed as ARV-11-031 on July 27, 2012.

# ABSTRACT

The City of Riverside has diligently worked towards a cleaner, greener environment for its citizens because it is the right thing to do. This document will outline how the City started its green movement and present an example of how other jurisdictions can begin their clean and green journey.

The City's Fleet Management Division submitted a matching grant application to the California Energy Commission in April of 2012. The Energy Commission's matching grant award was \$200,000 to partially offset the cost of installing a second compressed natural gas fueling station, the Acorn station, near the City's Water Quality Control Plant located at 5950 Acorn Street in Riverside.

The Acorn station was constructed using a design/build construction structure. Design-build is a project delivery system used in the construction industry to deliver a project in which the design and construction services are contracted by a single entity known as the design-builder or design-build contractor. Design-build, with its single point responsibility, carries the clearest contractual remedies for clients because the design-build contractor will be responsible for all of the work on the project, regardless of fault.

The Acorn station is a 24 hour, 7 days per week, publicly accessible compressed natural gas fueling station that provides compressed natural gas for City vehicles, fueling for businesses and citizens, and promotes the purchase and use of clean burning natural gas vehicles. It continues the City's efforts to improve air quality for its citizens. The Acorn station also provides a second compressed natural gas refueling location for disaster preparedness purposes as many heavy-duty vehicles that may respond in a disaster are compressed natural gas vehicles.

**Keywords:** Compressed natural gas, station, Acorn, Riverside.

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## **EXECUTIVE SUMMARY**

The Acorn fueling station location will provide compressed natural gas for city vehicles, fueling for businesses and citizens, and promote the purchase and use of clean burning natural gas vehicles. The station will consist of one compressor for fast filling vehicles at two dual hose fast fill dispensers and five dual hose time-fill posts to allow refueling of 10 vehicles overnight and will also continue the City's efforts to improve air quality for its citizens by providing a high volume 24 hour, seven days per week publicly accessible facility.

The City of Riverside's Fleet Management Division submitted a matching grant application to the California Energy Commission in April of 2012. The Energy Commission's matching grant award was \$200,000 to partially offset the cost of installing a second compressed natural gas fueling station near the City's Water Quality Control Plant located at 5950 Acorn Street in Riverside. The Acorn station was justified based on the success of the original, Corporation Yard alternative fuel station.

The volume of compressed natural gas sales at the Corporation Yard has grown over the years and proven to be a reliable benefit to the City, both environmentally and economically. Throughput at the Corporation Yard compressed natural gas station has increased from 4,000 gasoline gallon equivalents when the station first opened in January 2004, to approximately 1,100,000 gasoline gallon equivalent per month (public and private sales) in 2014. The Corporation Yard station is one of the highest volume publicly accessible stations within the State of California, which justified the need for the Acorn station.

For the construction of this new, specialized facility, it is recommended that a design/build structure be used. Design-build is a project delivery system used in the construction industry to deliver a project in which the design and construction services are contracted by a single entity known as the design-builder or design-build contractor. In contrast to "design/bid/build", design-build relies on a single point of responsibility contract and is used to minimize risks for the project owner and reduce the delivery schedule by overlapping the design phase and construction phase of a project. Design-build, with its single point responsibility, carries the clearest contractual remedies for clients because the design-build contractor will be responsible for all of the work on the project, regardless of fault. Since this work is specialized, the number of qualified, potential proposers is very limited.

The City posted a Request for Proposals on December 21, 2012, for design build services. The Request for Proposals closed on April 11, 2013, with one proposal received. The specialized nature of the compressed natural gas station design build installation likely limited the number of qualified proposers due to the equipment specified and equipment agreements in place with manufacturers. City staff currently maintains the existing compressed natural gas station at the Corporation Yard; the same equipment was specified in the Request for Proposals for the new station in order to minimize maintenance expenses, staff training and spare part costs. Additionally, the project manager for the Acorn station also constructed the compressed natural gas station at the Corporation Yard in 2004. The proposal was deemed responsive and the contractor was qualified to perform the work.

When constructing a second facility, it is recommended that equipment be specified to match, as closely as possible, the first facility. The City specified specific equipment in the Request for

Proposals. Of this equipment, the specified Ariel compressor is the industry standard, made in America and competitively priced with other compressors.

The Acorn station is a 24 hour, seven days per week, publicly accessible compressed natural gas fueling station that provides compressed natural gas for City vehicles and fueling for businesses and citizens, and promotes the purchase and use of clean burning natural gas vehicles. It continues the City's efforts to improve air quality for its citizens. Additionally, its location on the opposite side of the city from the Corporation Yard and improves operational efficiencies for City departments by providing a location for City vehicles to refuel without having to drive back to the Corporation Yard. The station will also ease traffic congestion and wait times for customers with two locations within the City to refuel compressed natural gas vehicles. Additionally, Acorn station provides a second compressed natural gas refueling location for disaster preparedness purposes as many heavy-duty vehicles that may respond in a disaster are compressed natural gas vehicles.

# **CHAPTER 1:**

## **Sustainable Riverside – The Process**

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### **1.1 Endorsement of Sustainable Riverside Policy Statement**

The purpose of this project was to expand the City of Riverside's capabilities to provide an affordable, clean fuel for the use of residents, businesses, and the City in line with the City's Green Task Force recommendations. On February 6, 2007, former City Mayor Loveridge presented an Endorsement of the Sustainable Riverside Policy Statement to City Council. Mayor Loveridge is a visionary who felt it was time for the City of Riverside to commit itself to becoming a clean and green city. He felt it was important to lead other cities in the Inland Empire and in the State of California. The issue before the Council was to approve the Clean & Green Task Force's Sustainable Riverside Policy Statement. Mayor Loveridge foresaw that Riverside's future was that of a clean and green city.

#### **1.1.1 Clean and Green Sustainable Riverside Action Plan**

In December 2007, the City Manager's Office presented the Clean and Green Sustainable Riverside Action Plan. The issue before the Council was the successful implementation of the Action Plan to ensure sustainable growth while preserving the health of the local environment of Riverside for generations.

##### **1.1.1.1 Clean & Green Task Force – The Beginning**

In 2005, former Mayor Loveridge established the Clean & Green Task Force to develop a policy statement that would encourage a practical approach as to how the City could implement cleaner, greener, and more sustainable programs. On February 6, 2007, the City Council adopted the Sustainable Riverside Policy Statement developed by the Clean & Green Task Force. The Sustainable Riverside Policy Statement includes six basic concepts:

1. Sustainability is a vital and necessary civic goal;
2. City resources should be made available to explore each key area of interest;
3. Current capabilities and policy status must be assessed as a baseline for progress;
4. New policies, guidelines, and regulations should be developed using sustainable building design such as Leadership in Energy and Environmental Design and California Green Builder standards;
5. Implementation programs should be mandated; and,
6. Progress toward a Sustainable Riverside should be monitored and measured.

The Task Force also developed guidelines for a clean and green city:

1. Save water;
2. Keep it clean;
3. Make it solar;
4. Make it shady;
5. Clean the air;
6. Save fuel;
7. Make it smart; and,
8. Build green.

With the goal of transforming the Sustainable Riverside Policy Statement into an implementation plan, the 38-point Action Plan was developed. The guidelines noted above, state and federal regulations, and the City General Plan 2025 were incorporated in the development of the Action Plan.

The Action Plan addresses seven broad categories, encompassing all aspects of City life, including:

1. Energy
2. Greenhouse gas emissions
3. Waste reduction
4. Urban design
5. Urban nature
6. Transportation
7. Water

Each action item provides both direct and indirect benefits to Riverside. Major benefits include improved air quality, reduction of traffic congestion, increased accessibility, and use of parks and open space, and will allow Riverside to further its maturity as a safe, inclusive, and livable community.

Additionally, the General Plan 2025 requires that within 90 days of adoption of the General Plan 2025, a Clean and Green Action Plan be adopted and the Plan policies be included in the General Plan 2025 Air Quality Element. The adoption of the Action Plan at this time will meet this requirement.

## **1.2 Clean & Green Task Force – The Process**

The Clean & Green Task Force recommended that the City adopt a Sustainable Riverside Policy Statement that would guide Riverside in becoming a clean and green city. The Policy Statement included the six basic framing concepts noted in the previous section.

Former Mayor Loveridge appointed a Clean & Green Task Force to look into ways for the City to make residents' lives better by improving the City's appearance, making City practices more sustainable, and improving air quality. The task force included people from a wide range of civic organizations, professions, and academic institutions. They formed themselves into subcommittees, took trips to gather information, and expanded their internal discussions.

The City's Public Utilities Department introduced numerous conservation programs and made a commitment to raising 20% of its power from renewable sources. The Chamber of Commerce capably ran its Keep Riverside Clean & Beautiful program. The City purchased over 200 alternative fuel vehicles and replaced dirty diesel vehicles in an appropriate manner with help from grants from the California Energy Commission and the Mobile Source Air Pollution Reduction Committee. The context within which the task force operated in is that it is vital or recognize its role as stewards of the world. Rather than consume the globe's resources, people must use them wisely. We have an obligation to ensure that its grandchildren can live at least as well as we do. Riverside may only represent 300,000 of the world's 6.65 billion people, but it is the area where policymakers can make an immediate impact and set an example for other communities.

The bulk of the world's current and future sources of oil are located in politically unstable areas, creating national security concerns. Not only are we dependent on this oil, but we are sending

billions of dollars to these countries from the U.S. treasury. California is the sixth largest economy in the world. America's economic health is tied to its ability to get to work, run its computers and move its products around the country and the world. The efficient use of energy is central to that health.

## **Vision**

Sustainable Riverside works to maximize energy efficiency and makes the most efficient use of resources, and minimizes negative environmental consequences. Above all, it means meeting the needs of its citizens while not degrading or destroying the natural and constructed systems that will sustain future generations.

Mayors from more than 300 U.S. cities representing more than 45 million people have endorsed the U.S. Mayors Climate Protection Agreement of 2005, a statement which reflects a commitment to creating clean and green sustainable cities. That Agreement recognizes the need to enact policies and programs to reduce U.S. dependence on fossil fuels and accelerate the development of clean, economical energy resources and fuel-efficient technologies. The City of Riverside should also encourage change by finding ways to reward good behavior rather than simply penalize the bad.

The City's policies should support good practices. Incentives can be created and modified as we learn more about how to create a sustainable community. It is important to remember how these programs are interconnected. An example: planting trees to encourage walking is presented here as a way to reduce fuel consumption. But, trees will also reduce greenhouse gases, mitigate the heat-island effect and, by encouraging walking, improve health. The benefits of these ideas are not confined to the categories in which they have been placed.

Figure 1 shows the trees at the city's Acorn station.

**Figure 1: Acorn station landscaping with trees**



Source: City of Riverside

### 1.2.1 Solutions

**Save Water:** Water Access & Efficiency maintain water quality: We must use water wisely and find effective ways to maintain water quality.

**Keep It Clean:** Beautification & Waste Reduction: Public and private organizations must take an active role in litter prevention, waste reduction, and beautification.

**Make It Solar:** Renewable & Efficient Energy. We must continue to aggressively pursue the use of solar power. We must continue to conserve energy

**Make It Shady:** Trees & Landscaping. We must create a larger canopy of trees and water efficient landscaping to generate oxygen and consume carbon dioxide.

**Clean the Air:** Keep Working for Cleaner Air. The City should continue to move its fleet of vehicles to alternative energy including electric, natural gas, hybrid, and hydrogen with the goal of limiting the use of gasoline powered vehicles.

**Save Fuel:** Public Transport, Clean Vehicles, Less Congestion. The City must explore feasible ways to encourage public transit and to promote the use of such alternatives as bicycling and walking.

**Make It Smart:** Urban Functions & Planning. The City should create the Office of Sustainable Action incorporated in a City department which would coordinate the City's efforts of becoming a more sustainable community.

**Build Green:** Urban Design. The City must be a leader in expanding green building efforts to meet Leadership in Energy and Environmental Design standards and the California Green Builder program.

## CHAPTER 2: The New Acorn Station is Complete

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Installation of the Acorn compressed natural gas (CNG) station was completed at the corner of Jurupa Avenue and Acorn Street in February 2015 and the grand opening was held in March 2016. This new CNG station is located at the opposite end of the City from the Corporation Yard CNG station. The location improves operational efficiencies for City departments and saves wear and tear on vehicles by providing the opportunity to refuel locally without traveling back and forth to the Corporation Yard. It also eases traffic congestion and wait times for customers as there are now two locations within the City to refuel CNG vehicles. Additionally, it provides a second CNG refueling location for disaster preparedness purposes as many of the City's Public Utilities and Public Works Department's heavy-duty CNG vehicles may respond in a disaster. Figure 2, which is below, is a picture of the grand opening of the second CNG refueling location, the Acorn station.

**Figure 2: Acorn Station Grand Opening**



Source: City of Riverside

This new fueling station location provides CNG for City vehicles and fueling for businesses and citizens and promotes the purchase and use of clean burning natural gas vehicles. The station consists of one compressor for fast filling vehicles at two dual hose fast fill dispenser and five dual hose time-fill posts which allows refueling of 10 vehicles overnight. The new station also continues the City's efforts to improve air quality for its citizens by providing a high volume 24/7 publicly accessible facility.

The volume of CNG sales have continued to grow over the years and proven to be a reliable benefit to the City, both environmentally and economically. Throughput at the Corporation Yard CNG station has increased from 4,000 gasoline gallon equivalents (GGE) when the station first opened in January 2004, to approximately 100,000 GGE per month (public and private sales) today. This station is one of the highest volume publicly accessible stations within the state of California. The station, along with the City's very progressive alternative fuel program, is one of the primary reasons the City was named the #1 Government Green Fleet in the



nation in 2012, during the term of this grant. Figure 3 below shows a picture of the award that the City received for its alternative fuel program.

**Figure 3: #1 Green Fleet in North America**



Source: City of Riverside

The City successfully managed a design build agreement for the CNG fueling station. Since City staff maintains the CNG station at the Corporation Yard, the same equipment was specified for the new station in order to minimize maintenance expenses, staff training and spare part costs. Figure 4 below is a picture of the equipment.

**Figure 4: Same equipment specified at both stations**



Source: City of Riverside



The City is a municipal government that provides public services: public utilities – water/electric; public works – construction vehicles, refuse, sewers; parks – special transit, disabled/elderly; and recreation – park maintenance. The City's Fleet Management Division provides services in support of those services such as vehicle acquisition, disposal, maintenance, and repair and environmental compliance. The Acorn station is expected to increase service provision capacity and increase operational efficiencies through its location. It is anticipated that this new station will increase sales further by attracting new public consumers, particularly since it is located only half-mile off Van Buren Boulevard.

Figure 5 shows a picture of the first customer at the Acorn station and Figure 6 is a picture of the station time fills at the Acorn station.

**Figure 5: The first Acorn station customer**



Source: City of Riverside

**Figure 6: Acorn station time fills**



Source: City of Riverside

As previously noted, the volume of CNG sales at the original Corporation Yard CNG station has grown over the years and proven to be a reliable benefit to the City, both environmentally and economically. Throughput at the Corporation Yard CNG station has increased from 4,000 GGE when the station first opened in January 2004, to approximately 1,100,000 GGE per month (public and private sales) in 2014. The Corporation Yard station is one of the highest volume publicly accessible stations within the state of California, which justified the need for the Acorn station.

The goals of this project was to build a second CNG fueling station with one compressor for fast filling vehicles at two hose dispensers and five dual time-fill posts to refuel 10 heavy duty vehicles overnight. This second 24/7 publicly accessible CNG fueling station will provide fueling for businesses and citizens and promote the purchase and use of clean burning natural gas vehicles. This project was intended to continue the City's efforts to improve air quality in the community and provide a second location, on the opposite side of the City from the Corporation Yard, to improve operational efficiencies for City departments by providing an additional location for City vehicles to refuel without having to drive back to the Corporation Yard. The Council approved this project and authorized \$1,000,000 for the station construction and approved the \$200,000 matching grant from the CEC to offset installation costs.

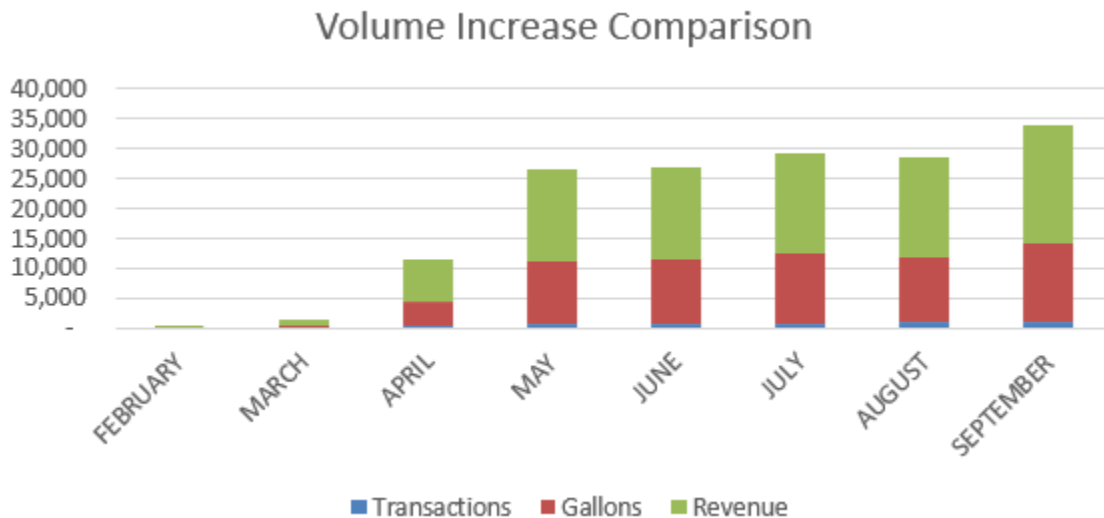
At the conclusion of construction at the Acorn CNG Station, the station began informal operation in February 2015. The table below shows the increase in the number of transactions, volume in gallons and revenue. Figure 7 shows the amount of throughput from February to September 2015. Figure 8 also shows throughput, transactions, and revenue at the Acorn station. Based on future expectations, this station will positively add to Riverside's environmental and economic growth.

**Figure 7: Acorn station throughout February – September 2015**

Month	Transaction Count	Volume in Gallons	Revenue
FEBRUARY	30	52.99	\$85.79
MARCH	74	553.66	\$896.33
APRIL	389	4,180.79	\$6,768.57
MAY	840	10,223.76	\$15,337.51
JUNE	898	10,535.53	\$15,584.94
JULY	944	11,402.42	\$16,829.67
AUGUST	1,000	10,937.47	\$16,600.36
SEPTEMBER	1,186	12,928.70	\$19,641.07

Source: City of Riverside

**Figure 8: Acorn station throughput February - September 2015**



Source: City of Riverside

The City of Riverside produced a turnkey CNG station and now has a second, reliable CNG station at the water district facility location six miles off the 60 freeway. The size of the station is based primarily upon the number of natural gas buses (school district client) planned to be fast filled either during the morning or late afternoon daily. As the local school districts begin replacing their older school buses and increase the number of CNG buses, there will be a large enough station to rapidly refuel these buses and any other vehicles from businesses and the public.

# **GLOSSARY**

**CALIFORNIA ENERGY COMMISSION (CEC)**—The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The Energy Commission's five major areas of responsibilities are:

1. Forecasting future statewide energy needs
2. Licensing power plants sufficient to meet those needs
3. Promoting energy conservation and efficiency measures
4. Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels
5. Planning for and directing state response to energy emergencies.

**COMPRESSED NATURAL GAS (CNG)**—Natural gas that has been compressed under high pressure, typically between 2,000 and 3,600 pounds per square inch, held in a container. The gas expands when released for use as a fuel.

**GASOLINE GALLON EQUIVALENT (GGE)**—The amount of alternative fuel it takes to equal the energy content of one liquid gallon of gasoline. GGE allows consumers to compare the energy content of competing fuels against a commonly known fuel—gasoline. GGE also compares gasoline to fuels sold as a gas (natural gas, propane, and hydrogen) and electricity.